# Field data analysis of a flooding household stormwater detention system

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***Abstract***
*This study describes the analysis being carried out for a field test of household stormwater detention system. The set up included a 0.95m$^2$ house roof and a 4.40m x 4.70m x 0.45m on-site detention tank. Roof gutter and 0.1m diameter downpipe were installed connecting the roof to tank while 0.05m diameter pipe was connected to the tank as outlet. A total of 114 full units and 12 half units of precast concrete pieces named StormPav Green Pavement were laid within the tank. Two observed events are highlighted. Storm event happened on 22 February 2020 with a 48mm peak rainfall causing a flash flood within the housing estate of the field test site. Another storm event on 16 January 2020 had a 42mm peak rainfall but no flooding occured. Both observed storm events were classified as heavy storms for having rainfall depth over 40mm.*

*Comparisons were made to the design data corresponding to the 15-minute 10-year ARI design rainfall that was estimated at 46mm. Upon investigation, the main cause of flooding was due to the underestimation of design water level determined at 0.35m. This is due to the uncommon detention storage spaces provided by the StormPav Green Pavament with multiple chambers created by precast concrete pieces. The observed water level was recorded at 0.47m for 22 February 2020, a level with 0.02m exceeding the 0.45m tank-full level while the recorded water level was 0.40m for 16 January 2020 leaving a tight 0.05m vertical gap before the tank-full level. As such, the field test had demonstrated its values in rectifying the design data.*

**Keywords**: Drainage, Field test, Flash flood, On-site detention, StormPav, Urban runoff.

## Introduction

A field test was completed in a housing estate in Samarahan, Sarawak, Malaysia for a household stormwater detention system (Figure 1a and figure 1b). Being in a household environment, any overflowing from such a system shall create disturbance to the residents. However, during the course of data collection, the research team had encountered one storm event that caused the flooding of the system (Figure 1c). This study was a post-mortem analysis of the said system.

The stormwater facility was meant to be placed at the car porch in Malaysian houses[16,17]. Stormwater runoff from the roof was channelled via roof gutter and downpipe to enter an on-site detention (OSD) tank for temporary storage before being discharged to urban drain via an outlet [11]. The OSD tank was supposed to be built underground. However, in this case, it was constructed above ground so that it could be removed once the study ended as permitted by the voluntary property owner. Within the OSD tank, multiple precast concrete pieces were assembled. These were named StormPav Green Pavement System, or in short, StormPav[14].

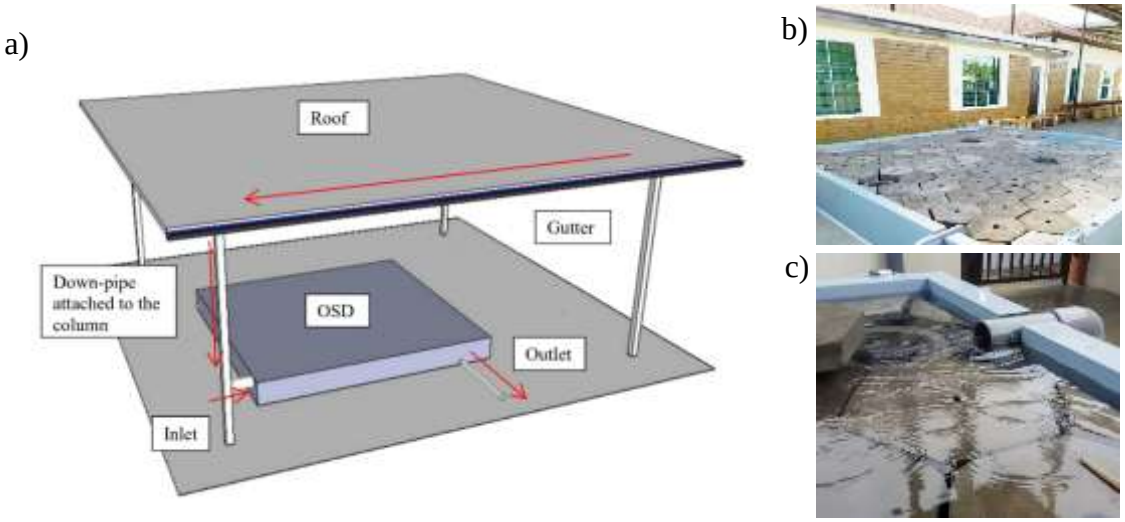


**Figure 1: Field test for household stormwater detention system, a) Schematic drawing b) Completed set up and c) Overflowing event**